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Marshall Space Flight Center



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Improved Fabrication of Electrolytic Capacitors

An improved fabrication method has been developed for wet electrolyte capacitors. The resulting capacitors are bipolar.

A cylindrical tantalum can is used in the procedure as shown in Figure 1. A polypropylene or Teflon disk is placed on the bottom of the can. In addition, a Teflon sleeve with a resilient interference fit is inserted just below the open end of the can. Next, a slurry is prepared by mixing tantalum powder, 1- μm to 25- μm average particle diameter, in a liquid vehicle. The vehicle consists of a binder such as methylmethacry-

late and a solvent, such as acetone, toluene, or substituted glycol ether. A predetermined quantity of the slurry is dispensed on the bottom of the can.

In the next step, the can is spun about its axis by a motor-driven apparatus. As the can spins, centrifugal forces push the slurry against the inner walls of the can. The nonwetting surface of the Teflon disk prevents the slurry from remaining on the bottom of the can. The sleeve on the top stops the slurry from pouring out of the can. It is important to select the right amount of slurry so that its thickness deposited on the walls is no greater than the sleeve thickness.

During the spinning, heat (approximately 125° C) is applied to the can to dry the slurry deposited on the walls. After this process is over, the disk and the sleeve are removed. The coated can is then fired in a vacuum furnace at a temperature of approximately 1750° C. During the firing, the organic binder is burned off, leaving only tantalum particles sintered to the can wall.

After the can is prepared, a porous tantalum pellet is made by pressing tantalum powder in a mold and firing it at a temperature of 1750° C. Next, a lead wire is welded to the pellet. Then both the inside cylinder walls and the pellet are oxidized by an electrolytic solution. The lead wire then is fitted with a glass layer and a header plug all fused together, the glass serving as an insulator.

The parts are then ready for assembly (see Figure 2). First, an insulative cup is fitted to the bottom of the can. Next, an electrolytic solution consisting of white sulfuric acid gel is inserted into the can. Then the pellet is put into the can and is fitted tightly into the cup. Finally, a bead weld is formed between the can and the header plug. A typical capacitor made this way has a diameter of 1 cm (3/8 in.) and a length of 2 cm (3/4 in.), although other dimensions can be used.

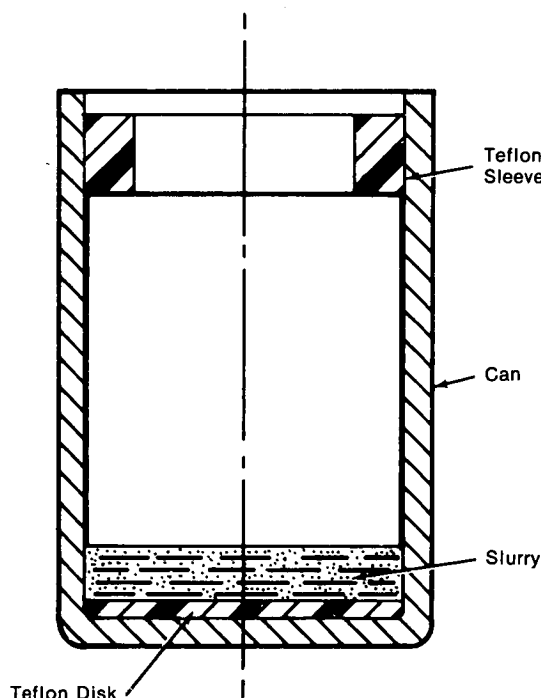


Figure 1. Tantalum Can Before Spinning

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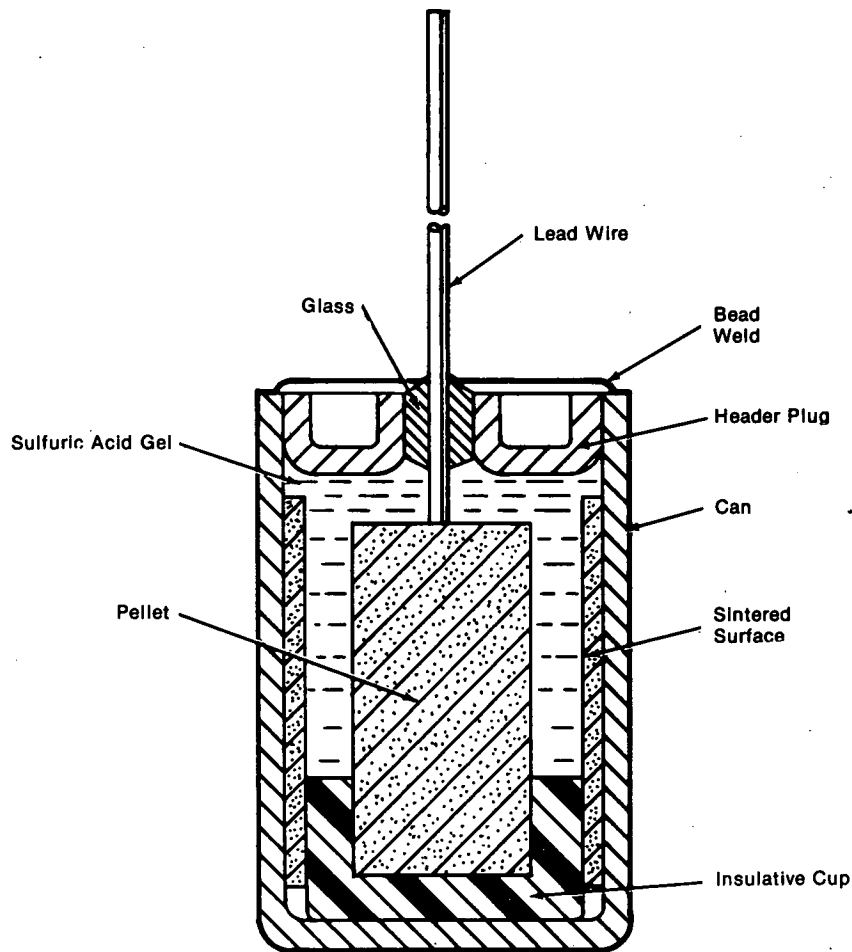


Figure 2. Electrolytic Capacitor

Note:

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Patent status:

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